Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
Amendment of Sections 15.35 and 15.253 of the Commission's Rules Regarding Operation of Radar Systems in the 76-77 GHz Band	))	ET Docket No. 11-90 RM-11555
Amendment of Section 15.253 of the Commission's Rules to Permit Fixed Use of Radar in the 76-77 GHz Band	))	ET Docket No. 10-28

PETITION FOR PARTIAL RECONSIDERATION OF FCC-12-72A1 RELEASED 2012-08-21

Pursuant to Section 1.429 of the Commission's rules, NavtechRadar hereby submits this petition for partial reconsideration of the Order in above captioned proceeding (That being FCC-12-72A1)

INTRODUCTION

Pursuant to 47 C.F.R. 1.429, NavtechRadar respectfully requests that the commission reconsider its decision in the Order FCC-12-72A1 that the limited use of fixed radars in this band be restricted to airports only. As the commission has already highlighted, in para 26 of FCC-12-72A1, there is no evidence to suggest that the band should not be shared and we feel that with the exception of the Radio Astronomy users the Automobile Industry seek to monopolise its use to the detriment of the public interest. It is noted that the change restricts fixed radars meeting the criteria outlined to applications that are in "at airport locations". Yet despite the restriction FCC acknowledge that fixed radars with the same level of emissions as those on mobile vehicles such as automobiles should be able to share the band. Comment has been made to lack of conclusive evidence that there is incompatibility to which this petition will show the contrary is true. There is evidence that there is no interference between fixed infrastructure scanning radar and automotive radar. This petition then will outline the reasons to allow use of the 76/77GHz band for fixed radar applications, define a segment of those applications currently in use in global regions (but not limited wholly to those examples given) and will show compelling evidence that there is no interference of consequence. It will also provide evidence of applications and clients/prospective clients of Navtech Radar for whom there is a clear demand for product and show that the shared use of the band for fixed and mobile applications outside of those stipulated in the order FCC-12-72A1 adopted 03 July 2012 is in the public interest.

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Petition Request/Executive Summary

The Navtech Scanning Radar system provides an Automatic Incident Detection capability, for use on highways and interstate roads. By continually measuring and tracking vehicles, people and debris using high frequency radar the system is able to generate incident alerts, whilst maintaining extremely low nuisance alarm rates. Uniquely, the system is unaffected by rain, fog, dust, smoke and direct sunlight and so is well suited for incident detection, both above ground and in tunnels. The system's ability to detect incidents in one lane, whilst ignoring traffic in another, means that it is well suited for highway/Interstate running lane management as well as traffic control and monitoring through tunnels and over bridges. With no routine cleaning operations, high MTBF rates and long detection ranges (ensuring low equipment numbers) these factors lead to low lifecycle costs. In addition to highways applications we would ask that a variant of the Radar (a different model) should be granted FCC approval for use for use in Industrial Automation, where the radar acts as a collision warning system for mounting on ship to shore cranes. Other users currently in operation globally include Coal and Iron Ore loaders, front of train detection for automatic train control and Autonomous Guided Vehicles in ports. By measuring with high reliability the range to obstacles that may lie within the path of the moving crane boom, costly collisions and the consequential loss in productivity can be eliminated as well as enhanced safety and reduced risk to life. Radar operating in this 76-77GHz band offers a number of advantages, over other radar devices. The measurements are high resolution, enabling detected objects to be accurately located and tracked. With a high operating frequency the radar devices themselves are smaller and easier to install and maintain. Lower cost componentry is becoming more widely available for radar operating in this band. Equally, the recent FCC order FCC-12-72A1, is aligned more closely with ETSI rules in the same band. Customers would benefit from lower costs and faster time to market if some common hardware components could be used in both areas. Navtech Radar wishes to supply fixed and mobile 76-77GHz low power FMCW radar devices with a steerable antenna to markets where FCC rules apply for the following purposes:

(i) To detect the location of stopped vehicles or pedestrians in a dangerous situation on the road traffic networks. A radar sensor and associated processing software will detect an incident, in all weather conditions over hundreds of yards, and report the occurrences to a central traffic control centre. The radar is typically mounted statically on a pole or gantry, by the road side. Such systems are in use elsewhere for the purpose of incident detection in tunnels, on bridges or other strategic roads and provide both commercial value and enhanced safety to the public. Geographical examples of such use include a number of countries in Europe, Australia and South East Asia.

(ii) To provide a high resolution obstacle detection capability for industrial machinery. Suitably configured radar and processing software can be used to halt the movement of a port crane for example, prior to an impending collision with the ship over which it is operating. In this configuration, the radar sensor is typically mounted upon the machinery. This may include port cranes/straddle carriers, mining trucks and ore carrying locomotives and trains. Such systems have been used elsewhere, providing improved productivity and safer operations in mines and ports and add both commercial value and enhanced safety.

(iii) To supply fixed radar systems for the purpose of security enforcement such as that used by homeland security at border crossings. The use of the higher frequency provides enhanced resolution and tracking capability and so enables better differentiation between detected objects and improved identification. In addition to the use of this application at airports (which is currently in operation globally) additional applications include protection of nuclear power plant, personal property (homes, land etc) railway yards (where vandalism and theft cost operators significant sums of money and has an direct impact on the public). These examples are not complete or exhaustive but are instead provided to show the wide and varied uses that are to the interest of the public safety and commercial benefit.

In para 26 of FCC-12-72A1 it states;

"*….With respect to the use of fixed radars outside of airports, we continue to believe that vehicular radars should be able to share the band with fixed radars operating at the same levels and note that there are no conclusive test results indicating that there would be incompatibility issues between the two types of radars. We recognize, however, that no parties have come forward to support fixed radar applications beyond airport locations in this band. Therefore, in the absence of a clear demand, we are not adopting provisions for unlicensed fixed radar operations outside of airport locations in the 76-77 GHz band at this time….*"

At this time therefore we wish to be seen to be "coming forward" and believe there is both a demand and public need for use of the fixed location 76-77GHz radar as well as other mobile applications not restricted to automobiles.

1.0 History

The main benefits of using the 76 GHz to 77 GHz frequency band are lower weight, improved measurement results (e.g. range resolution) and reduced size for new equipment. Better velocity resolution is achieved because of the high range resolution and simple FMCW modulation techniques are possible. This motivates usage of the frequency band for many types of applications for short range radar systems. It was for this reason that Navtech Radar was formed by a team of engineers in the 1990's to develop millimetre wave radar sensor solutions for industrial applications. The first systems were originally developed as navigation sensors for container handling vehicles in stevedoring applications. This technology was then used in 1993 to successfully demonstrate the first automated port vehicle to use millimetre wave radar. Since 2007 76-77GHz radars have been placed in operational use in tunnels and Motorways (Interstate roads) and in tunnels both in the United Kingdom and Europe with global expansion into S.E. Asia and Australasia. Currently Navtech radars application list includes Security Solutions, Automatic Incident Detection (AID), Autonomous Vehicle Navigation and Obstacle Detection.

2.0 Evidentiary examples

Although by no means exhaustive the examples referenced are aimed to address concerns that Automobile manufacturers and their partner companies involved in radar manufacture for automobile usage might have about interference of fixed radars pointing down at the highway upon radar sensor systems mounted on vehicles.

1. The M42 in the heart of England is a short Motorway (Interstate) that has extremely variable traffic flows, as it functions as part of a cross-country north-east to south-west route; an orbital route for the city of Birmingham; and an access road to Birmingham Airport, the National Exhibition Centre, and business parks and residential areas. It handles over 120,000 vehicles per day. Navtech 76 - 77 GHz Radars and other associated ITS equipment (such as Variable Message Signs and Digital speed enforcement cameras) are installed on this section of highway, to allow the use of the hard shoulder in peak periods and regulate traffic flow by varying the speed limits automatically. The project is widely considered successful with an improvement in average journey times of more than 25% on the northbound carriageway. In addition, UK

Highway Agency statistics showed overall fuel consumption reduced by 4% and vehicle emissions fell by up to 10%. Clearly reduced fuel costs and traffic commute times with increased safety measures provided a boost to public confidence in using the M42 motorway. After 5 years since install there have no reports of any kind regarding radar interference with vehicle mounted radar systems.

2. The A3 Hindhead tunnel is a 1.1 mile (1.8km) section of twin-bored tunnel located between London and the south coast of England in an area of designated natural beauty. Its construction followed decades of severe congestion on the A3 but overland highway expansion was deemed unsuitable for environmental reasons. With 35,000 vehicles per day travelling each of the two bores Navtech 76 - 77 GHz Radar was deemed as crucial to the project to provide advanced incident detection such as stopped vehicles, slow traffic or wrong way traffic/people in the tunnel and debris. With continuous operation for over a year there have been no reports of any kind regarding radar interference with vehicle mounted radars sensors.

3. From 2005 up until the present day, 76-77GHz radar are being used as the primary navigation sensor of Autonomously Guided port vehicles, at a port operation in Brisbane, Australia. 25 Automatic straddle carrier vehicles unload commercial cargos in a 24 hour and 365 days a year operation. No cases of radar to radar interference have been reported in this operation.

3.0 Radar Automatic Incident Detection

The requirement to automatically detect abnormal and potentially dangerous incidents on national motorways and trunk roads has been gaining increased attention over recent years. As road networks become more congested, timely detection of stopped vehicles, unauthorised pedestrians or debris is vital in order to take appropriate action quickly. Fatal Incidents within tunnels in particular have raised concerns about current safety systems. During the 1999 Mont Blanc Tunnel fire for example, reliable incident detection systems and an improved inter agency response could have helped avert loss of life. Legislators have responded by recommending the wider use of the available detection technologies, in tunnels over 500 yards long .

Major road networks are becoming increasingly congested, a trend that is set continue as the financial and environmental costs of adding more lanes to existing roads is prohibitively expensive. All lane running (whereby an existing emergency lane or hard shoulder is converted into a running lane) has become an accepted means of adding additional capacity whilst keeping control of the costs. However, before the hard shoulder can be opened as a running lane, road operators need to be sure that it is clear from stopped vehicles, people or debris. As the use of hard shoulders for running lanes becomes more widespread, automatic checking for “incidents” become increasingly important.

Certainly within tunnel operating environments, but in particular above ground, all weather performance of any detection system is paramount. Systems must operate in rain, bright sunlight and even fog. In addition the detection rates must be maintained, whilst driving down false alarm rates to a level that ensures operators continue to treat system alarms seriously. Furthermore, long range sensors are needed to increase coverage from each installation and reduce overall costs.

It is within these types of applications that Navtech have delivered millimetre radar based Automatic Incident Detection System. The radars purpose is not simply for traffic enhancement/enforcement but to increase the safety of those who use the highways.

4.0 Navtech Radar ClearWay™

The ClearWay™ system comprises high frequency radar that continually scans through 360 degrees in azimuth. A single sensor can scan hundreds of yards of road surface, both with and against the traffic flow to detect incidents on a lane by lane basis, with high accuracy. The long detection ranges provide lower installation costs in terms of sensor numbers, to the benefit of the entire infrastructure. Fewer installed radar, means fewer mounting posts, reduced civil installation work, lower maintenance costs and a lower overall communications bandwidth.

The radar solution is unaffected by changing light conditions, fog, dust or rain – which makes the solution highly applicable for use on a road network, where other technologies can struggle with the changing light levels or conditions. ClearWay™ radar solutions have been successfully deployed in the Middle East for example, where ambient temperatures are high and the visibility is often impaired by sand and dust (comparable examples might be the states in the Southwest USA such as Nevada, Arizona New Mexico and Texas). Genuine incident alarms are generated for stopped vehicles and pedestrians on, or next to, the multilane highway.

Alarm generation is key to incident detection and keeping the level of false alarms to a minimum is paramount. If false alarms become too numerous then network operators will either not use the system or pay less attention to alarms when they are raised. The Navtech radar incident detection system has been shown to have very low false alarm rates.

The ClearWay^{TM} solution not only detects slow or stopped vehicles, it can also be configured to detect people or debris. Actual detection ranges for different objects is determined by the distance from radar to incident. The TS-350X model for example will detect a slow or stopped vehicle at a range up to 550 yards radius (1100 yards total diameter) on each side of the carriageway, subject to line of sight from the radar mounting location. In addition, the system can also measure nominal speed, across a number of lanes, on a typical highway to monitor the efficiency of the road network. The system can also provide accurate queue detection when average speed falls below a certain threshold.

Through the process of detecting and tracking vehicles within the radar line of sight, the system measures the distance along the carriageway, and the lane which a vehicle is travelling within. Within the associated management software, alarms can easily be set to monitoring one lane only, whilst ignoring others. It is a natural extension of the radar and processing system to be able to detect in the hard shoulder only whilst ignoring queued traffic or similar within the adjacent lane one. Long detection ranges, and accurate lane measurement, are only possible for radar operating at short millimetre wavelengths. In this case using the 76 – 77 GHz band

Recent enhancements to the tracking algorithms allow the sensor to detect vehicles tail-gating or changing lanes while restrictions are in force as well as the ability to count and classify the vehicles as they pass thus allowing control rooms the ability to monitor the flow of traffic at various times and differentiate between a car and a “big rig”.

4.1 Technical Overview

Within the 360 degrees of radar coverage, a signal return is processed every 10 inches from the sensor itself up to the maximum sensor range of 550 yards radius. The system employs a frequency modulated sensor and so unlike

Doppler systems, no movement is necessary to measure a vehicle, person or similar object within the radar line of sight. The radar will measure stationary or moving vehicles, people and debris equally well.

Areas for detection are defined within the associated software processing system. These generally cover the lanes of the road surface and in some cases, depending on a client requirement, may include the median strip or run off areas next to a road. The radar sensor itself measures range, bearing and signal power at a refresh rate of once per second. This data is continually compared to background radar measurements, signals will be received for other road infrastructure including barriers and street lights etc. New objects, that are measured by the radar - but do not form part of the background scene - are sent to a software 'tracker' process. This process will take a succession of measurements, direct from the radar and match them together over consecutive radar scans.

In addition to the radar hardware itself the other piece of key technology in the system is the tracker. It follows multiple hypotheses for each sequence of radar measurements, and fits them to different movement models and signal power models for people, vehicles and debris. A 'track' is the processed information, for each object. The track includes the location, the direction, size and speed amongst other information.

The valid tracks, generated by the tracker are passed to an alarm generation process. At this stage, alarm signals are raised should a track break a series of rules. For example, if a tracked vehicle speed falls below a threshold, for more than a defined period of time an alarm will be raised. Typically a stopped vehicle alarm will be raised if a vehicle is tracked at a speed of less than 5 mph for more than 10 seconds. In this way, the track can be generated and followed for several seconds to confirm that it is valid, before an alarm is raised. Alarms for people, debris or reversing vehicles are similarly raised with different rules used for the alarm generation. Because all vehicles and people are tracked over time the threshold time within which alarms are presented to the control room can be adjusted, allowing a driver who stops to check a map to be ignored instead of sending a response vehicle to check it out.

In addition, the free flowing traffic that does not break the rules is measured. The average speed for a section of highway is calculated regularly. Typically 100 yard sections are used, every 30 to 60 seconds. This processed information is then available to a control room operator and can be used on the background map, to show particular areas of congestion on the highway. The overall system therefore, has a dual benefit of providing traffic speeds for highway management purposes, as well as incident data.

4.2 ClearWay™ Radar for Highway Automatic Incident Detection

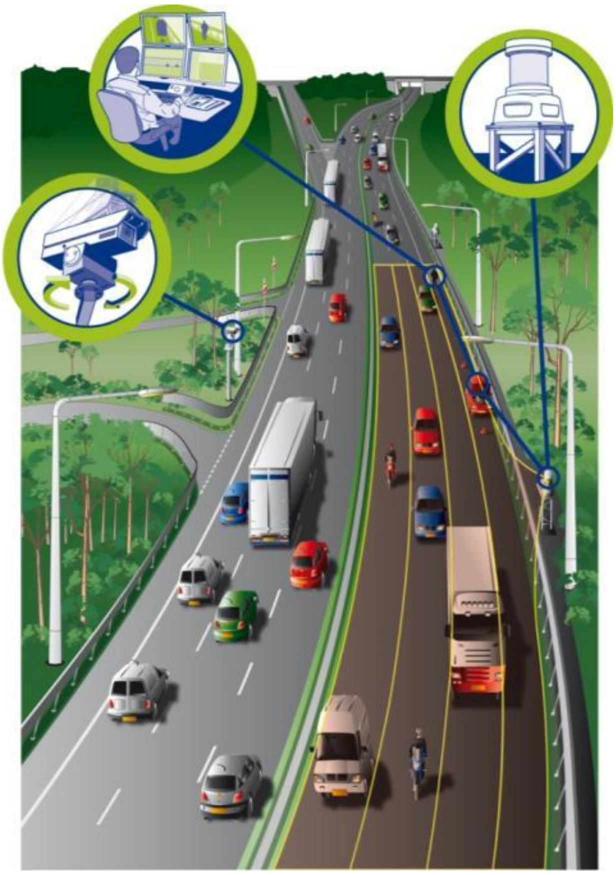

Figure 1 **Multi lane coverage and incident detection from a single radar**

Figure 1 shows how one or more radar may be deployed, for incident detection across a multilane highway. The radar scans through 360 degrees, valid detection zones are configured in the software (shown in yellow on the illustration) and these correspond to the lane layout of the road. Although the radar may cover areas outside of these detection zones, they will be not included in the tracking and alarm generation processes.

In certain locations, the radar may be located in a median strip in the centre of the road. Alternatively, radar have been installed where good line of sight exists across all lanes from an installation to the side of the road. In this case the radar software can be configured to track across all lanes, both up and down stream of the traffic, from a single sensor.

4.3 ClearWay™ Radar for Automatic Incident Detection in Tunnels

Millimetre Wave Radar will operate underground in tunnels in much the same way as it does on surface roads. ClearWay™ will detect slow or stopped vehicles, pedestrians or debris. During trial installations, a careful comparison has been made to actual events that occurred within a reference site, over several months. Nuisance alarm rates were measured at 1 per 24 hour period at the time of the trial, for a two radar system. This is a far better performance than other technologies, such as cameras based systems.

Within a tunnel environment, it is often the line of sight that limits the maximum detector range. To gain the best coverage, wherever possible, the radar should be placed towards the outside edge of any curve in the tunnel wall. From this position the radar will "see" further around the tunnel curvature. During a site survey, radar locations are designed, to ensure around curves and give overlapping coverage between adjacent sensors. The survey also takes into account changes in the tunnel bore elevation, with radar usually being mounted such that they are parallel to the road surface.

Figure 2. Incident detection within a tunnel environment

4.4 ClearWay^{TM} Radar for Hard Shoulder Monitoring

ClearWay^{TM} will automatically detect incidents on the hard shoulder of a motorway, whilst ignoring slow or stopped vehicles on an adjacent lane. Overall, the system operates in a similar way to the Motorway and Trunk road AID mentioned above.

There are two factors that limit the ability of the overall system to discern between an incident in the hard shoulder and traffic in lane 1. The first is the radar beam width in azimuth, which is physically set by the radar hardware. A narrowing of the radar beam width requires a larger antenna. To keep the overall radar sensor package of a sensible size, operation in the 76 – 77 GHz band is necessary, rather than a lower operating frequency.

4.5 Safety and Compliance

The TS-350X radar is of very low transmitted power, approximately 10mW and is of the same band and transmit power as is in common use for automotive cruise control applications. As such, it is compliant with the following standard: ETSI EN 301 091-1 which limits the peak power (e.i.r.p.) to 55dBm and the mean power (e.i.r.p.) to 55dBm +10 log (D) or 50dBm (whichever is smaller) where D is the ratio of the area of the beam to the total area scanned by the antenna. This also includes ENV 50166-2 Human exposure to electromagnetic fields. High frequency (10 kHz to 300 GHz). Navtech have installed multiple radar operating in the same band in close proximity and interference between adjacent radar has not been encountered.

4.6 Typical system design

Radar can usually be mounted on posts of columns by the side of the carriageway. Mounting height varies depending on the application, for coverage over multiple lanes the overall coverage is typically 4 yards from the road surface to the radar beam.

Each radar type requires an IP connection and 24VDC power at 24 Watts. The radar housing is of a cast aluminium construction with a nominal weight of 17 kg. The radar are connected via IP to back end server hardware. This hardware is usually located remotely and well away from the roadside in an equipment room or control centre. The tracker and alarm generation processes run on these servers.

Radar Automatic Incident Detection is not seen as a replacement for cameras. The radar benefits from good all weather performance, and low false alarm rates. Once an incident is detected though, operators will still want to be able to get visual verification and to take appropriate action. In this case a long range PTZ camera can be moved, either manually or automatically by the radar processing system.

The radar sensor itself requires preventative maintenance every 3 years. This can be done in-situ at the roadside. Once access is gained to the radar the operation takes about 15 minutes per sensor. No cleaning of the radar assembly is required during normal service. The latest data available on MTBF, revalidated for the 'TS' series radar, is in excess of 75,000 hrs per sensor, based on component count and also incorporating information from field returns for the mechanical components. Standard 217Plus is assumed at 85°F ambient.

5.0 Quay Crane to Ship Anti-Collision System

It has been noted that a rising number of incidents occur in port operations relating to crane booms hitting ships. The TT club, the transport and logistics industry's leading provider of insurance, has stated that "Crane booms colliding with the structure or equipment of a ship is an all-too-common occurrence, causing serious injuries to workers and costly repairs and operational downtime" (World Cargo News, July 2007). In 2006 the TT club (an industry insurance body) reported that 72% of accidents relating to handling equipment and property damage had a Human Error component. Worldwide it was estimated that 40 Ship to Crane or Crane to Crane collisions occurred in 2006 (WCN March 2007). Repair costs can reach $2m per crane. An increasing number of accidents occur whereby a crane boom collides with the structure of a vessel which it is loading / unloading. The traditional way of preventing such accidents is a simple trip wire system, running down the length of the boom on either side. If the wire makes contact with an obstruction then it tightens, causing power to be cut from the crane's long travel control system. Whilst simple, the system is often ineffective. It requires regular maintenance as it comprises of moving parts and pulleys and the wire can stretch. No pre-alarm signal to slow down the crane prior to a trip alarm is available, and its operation is 'intermittent' at best for detecting thin ships antenna and radio equipment. These can be expensive to replace and are usually located high up on the vessel. Other more up-to-date methods of detecting obstacles to the ship to shore crane during operations include scanning high frequency radar or laser sensors. Dependent on the sensor configuration, these scan an arc and measure the range to obstacles that might obstruct the boom. They provide an output alarm signal to the cranes control systems.

5.1 Radar as an industrial automation sensor

High frequency radar have been used as industrial automation sensors in port operations for well over 10 years. They bear little resemblance to the larger and more cumbersome low frequency systems that are typically used in airports to detecting approaching aircraft. With a higher frequency operation comes a vastly reduced sensor housing size and an increased measurement resolution. The high frequency radar still retains the advantages of using radar technology instead of alternative detection means, such as:

- They operate and detect in all conditions, including rain, fog, sea spray and dust.

- The sensor does not need regular cleaning and is not susceptible to airborne contaminants covering or obstructing the transmitter.
- The radar does not generate nuisance alarms, even when operating in bright sunlight.
- As standard, the radar sensor will operate to distances in excess of 100 yards radius.
- 360 degree coverage is standard from a radar sensor; with configurable detection zones anywhere within that coverage to generate detection alarms for both slow down and stop.
- High resolution range measurement, so the distances to obstacles can be accurately measured. This prevents nuisance trip alarms, but allows the crane to work safely on the containers that are adjacent to the ship's structure.
- High sensitivity, for detecting both small antenna and large ship superstructure obstacles.
- Low maintenance, 3 yearly routine preventative maintenance.

6.0 Navtech Anti Collision Radar

The Navtech Anti Collision System uses high frequency radar to identify hazardous obstructions in the path of moving crane booms. Should the crane approach the ship too closely or the ship drift towards the crane, the radar will generate alarm signals to the control systems. Unaffected by heavy rain, fog, dust or bright sunlight, it operates effectively in all weather conditions twenty-four hours a day. The radar sensor will at the least help avoid expensive insurance claims from crane and ship collisions and may save lives or reduce injury to workers. The system ensures safe operation of the crane during loading / unloading or working of the back-reach, without affecting the operational efficiency. Because of the high range resolution of the sensor, the crane is able to closely approach the ship's superstructure without prematurely triggering the stop alarm, and so operational efficiency is not affected.

Specifically designed for industrial applications, Navtech radar systems are field proven and are operational worldwide in Ports, Airports and Mines. All Navtech radar sensors have been rigorously environmentally tested and are field proven. They are designed for industrial operation and include internal system error checking and diagnostics.

6.1 Radar installation and operation

The radar is mounted at the same height as the part of the crane it is to protect, usually just beneath the main beam. Typically a single sensor will be mounted at the far end of the boom. See Figure 3 for mounting positions. In this position the radar can scan a horizontal plane beneath the boom. Protected zones will be set up on either side of the crane. Although the radar has 360 degree coverage the exact area that will be covered on either side of the crane is defined in software. The absolute position of the ship and the crane is not important, only the relative position. This allows either ship or crane to move during the unloading process without effect on the obstacle detection system because the radar is physically mounted on the crane structure. A further advantage of this approach is that movement of a ship based structure, a ship's crane for example, into the path of the quay crane will also be detected by the radar. In these circumstances an alarm will be generated even if the quay crane and ship are stationary.

Within the field of view covered by the radar, different levels of alarm are generated as an obstacle enters the detection zones. These comprise "Slow Down" and "Stop" alarms, as the crane beam moves closer to any component of the ship. These are generated independently on each side of the boom (4 alarms in total). A further health alarm is also available. This is implemented with a series of internal checks for radar system health and performance. In the event that any of these fail, the health relay is dropped to trigger a maintenance action.

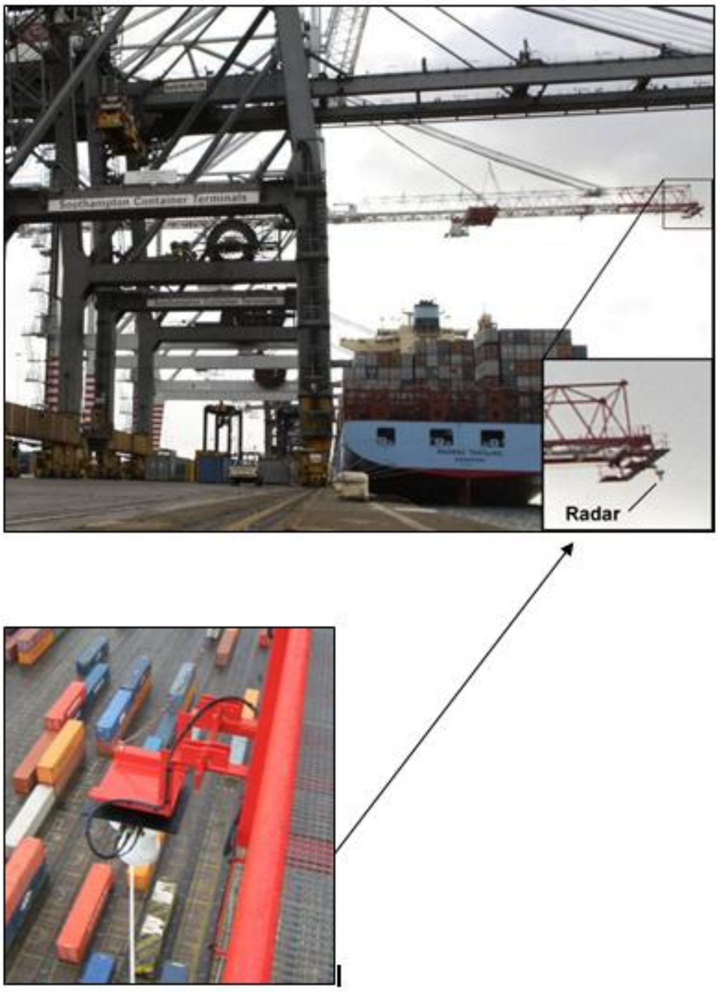

Figure 3Typical radar installation

7.0 The future use of Radar in this Band

The current use of 76 GHz to 77 GHz radar technology is in both Automotive and surveillance applications. Surveillance applications may include security or FOD. The broad range of future applications however requires different antenna systems and operation modes tailored to the specific installations to achieve the intended performance. To meet higher requirements on range and velocity resolution for a radar sensor, the frequency band 76 GHz to 77 GHz has been identified as an eligible choice for a new type of short range surveillance radars. According to the CEPT/ERC REC 70-03 [i.5], annex 5 this frequency band is allocated to vehicle and to **infrastructure** radar systems. Depending on the antenna configurations and the installation position, the proposed radar can cover ranges up to 1,600 m. The range resolution can be down to 0.5m with a beam width of 1,5° in azimuth and elevation beam that vary considerably depending on the antenna characteristics.

7.1 Radar applications and scenarios:

There is a wide range of applications, which can be put into the following categories.

Category 1: ground based vehicular applications;

- Rail and general transportation.
- Off-highway construction, mobile crane, lorry, machinery, agriculture.
- Unmanned vehicles, ground non-public transportation.
- Leisure vehicles, power sports.

Category 2: passive tracking / fixed infrastructure applications for perimeter surveillance and intruder detection and tracking for railroad applications;

- Outside perimeter area: to detect suspicious activities before entering the perimeter area (e.g. road/track crossing and railroad tunnels).
- Inside perimeter area: to detect suspicious activities inside the perimeter area as well as to track normal activities in order to prevent accidents and damage.

Category 3: applications in the industrial environment and quasi-fixed applications;

- Industrial and fixed crane application (collision).
- "quasi"-fixed crane applications (construction site):
    - collision avoidance during working procedure;

- collision avoidance during installation.

8.0 Market information

Category 1: vehicle applications;

The main applications in the category vehicular applications are:

- Rail applications with a total number of locomotives, railcars and trams
- Water/ship applications
- Sensor applications in heavy vehicles

Category 2; Security and Surveillance

The market for intruder alarm systems which includes radar sensors in 2013 is expected to be around USD 350 Millions, out of which the main part consists of outdoor sensors for perimeter surveillance. The radar system part will be in the USD 100 Million range but with an annual 20 % increase, implicating a growth in the radar part in the years to come. An indication of facilities that can be foreseen to have a strong need for area and perimeter surveillance is shown in table 1.

Region	Oil Refineries	LNG Terminals	Ports	Nuclear Power Plants	Total
Nordic	10	1	40	5	56
Rest of Europe	146	17	123	83	369
North America	178	10		75	263
Middle east	44	7	24	0	75
Asia Pacific	136	41		49	226
Africa	41	9		2	52
Latin America	56	7		6	69
Total Number of plants	611	92	187	220	1110

Table1: Facilities with a need for area and perimeter surveillance

In addition, there are a large number of other types of facilities (e.g. prisons, government buildings, camps, etc.) that are not included here. Further legislative requirements on security protection may also include more medium and smaller sized harbours and airports as potential customers. The average number of radar sensors for each surveillance area (airport, harbour, etc.) is in the range of 10 to 20/site, fewer for less extensive properties.

The end-users are different depending on which market segment is addressed. In the CIP area, typical customers are electricity utilities, having power and distribution stations to protect; correctional institutions; airports; harbours; oil and gas facilities; public transport companies, etc. In the maritime segment, typical customers are authorities responsible for maritime surveillance, e.g. the coast guard, the national maritime administration etc. Other emerging customers are the harbour authorities/operators. In the airport surveillance segment, the customers are the national or local airport organizations that need to improve, e.g. the surveillance of ground movements or Foreign Object Detection (FOD) on the runways.

Fig 5 Power plant with radar and automatically controlled camera (Camera controlled by the radar)

Category 3; Industrial Automation – Illustration of Radars for Navigation on AGVs below.

Fig 6 Straddle Carrier with Radars fitted in operation in ports.

Conclusions

Millimetre Wave radar systems, can be used for incident detection in a number of roadway environments and for anti-collision purposes in industrial applications. With long detection range and reliable performance, irrespective of the weather conditions, these type of systems offer the system designer a real and valid state of the art alternative to current detection systems. These systems are widely used elsewhere and geographical examples include Europe, S.E. Asia and Australia with new clients in South America emerging.

The technology provides commercial value and improved productivity as well as enhanced safety for the public in operations such as mining, ports and highway monitoring. Given the recent rule change on the 3rd of July FCC 12-72 (ET dockets 11-90 and 10-28) to allow the use of these frequencies on stationary or mobile vehicles and at static locations around airports Navtech Radar suggests that it would be in the public interest to allow the applications further expansion by allowing static systems beside highways for traffic control monitoring and for use in additional industrial applications. The radars fully meet the FCC decision as stated in para 14 and 15 of FCC-12-72A1 and have been used globally without incident or report of any type in relation to adverse effects caused by the system. Further we would request that other fixed locations for security applications such as border patrol (but not limited to this) by Homeland Security be permitted. Navtech Radar have had requests from companies and agencies in both the United States of America and other countries who follow the FCC guidelines, for product supply since 2009 and examples of those can be provided under confidential documentation if requested by FCC. Should this technology be allowed to be used, this would be for the public benefit both commercially and in terms of safety improvements. With no evidence of interference being an issue between automotive vehicle radar and with scanning radar mounted at height onto fixed structures. Objectors may say that there is a report due for completion end of 2012 in Europe by MOSARIM indicating levels of interference to which we would reply that such publications are not yet complete, that they have not tested any scanning radars nor run tests at heights of varying degrees and that MOSARIM has not consulted nor involved any manufacturer of 76/77GHz radar systems used for industrial Automation applications, highway incident detection, or security surveillance. Indeed MOSARIM have focused only on radar interference between automobiles or stationary radars in the band derived from the automobile industry at close proximity to the highway and have in no way looked at other applications. Lastly the committee have allowed the use of 76/77GHz radar in airport locations and we would ask that this be deemed as in or around the airport to allow for enhanced security applications in addition to the FOD (Foreign Object Detection) application. It may be of worth to note that in Europe CEPT/ECC have continued to allow the use of 76/77GHz fixed radar applications following the recent (29-31 Aug 2012) summit in Montegrotto. ETSI have been requested to carry out an independent study to evaluate any possible interference but in the absence of such evidence, as it currently stands, have not restricted the use of radars in this band to vehicular use only.

It is for the above reasons that we respectfully request the commission to adopt the appropriate changes necessary to permit the use of the 76/77GHz band for fixed structure applications in all of the application areas listed and that the term vehicle be applied to any ground based object that moves and therefore not limited to automobiles.

Bibliography

FCC-12-72A1 released July 5th 2012

ET Docket No. 11-90 and ET Docket No. 10-28

ETSI TR 102 704 V1.1.1 (Direct extracts)

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